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Title: **A Removable Adhesive Bond**

An Examination Petition according to § 44 Pat. Law, has been filed

Cited Publications

DE 32 16 603 A1
DE 92 16 731 U1
US 32 75 469

Abstract

A removable adhesive bond, wherein the adhesive bond is formed by a double-coated adhesive film material and is separated again by the effect of shear-forces in parallel to the plane of bonding.

DESCRIPTION

The invention deals with a removable adhesive bond, which is formed by a double-coated adhesive substrate material.

Two objects may be combined by means of an adhesive bonding, whereby after an encounter of problems, a separation of the adhesive bond and of the objects should be possible without causing a damage to the said objects. According to DE-PS 33 31 016, this kind of separation can be achieved at adhesive bonds prepared by means of double-coated pressure-sensitive adhesive films with an elastic substrate material by pulling in the direction of the plane of bonding. For this purpose, a special grip-area (a flap) is needed, which is formed as an integral part of the substrate material and is to extend out of the adhesive bond area, which is not always an advantage. At the one hand, the danger of an embrittlement of the extending part of the substrate material will exist at a longer duration of the bond, whereby a stretching of the material as needed for the separation of the bond, will not be possible anymore. At the other hand, the optical appearance of the flap is also seen as a disadvantage. Structural improvements for laminating these grip-areas are too complicated.

The substrate described in DE-PS 37 14 453 is afflicted with similar disadvantages. In this case, the adhesive bond will be separated again by pulling out an earlier inserted string.

Only in rare exceptional cases, a use of solvents may be possible for separating an adhesive bond.

The objectives to be achieved by the invention deals with the development of a separable adhesive bond according to the generic term of the claim 1, whereby this bond is to be separated again in a simple manner without the need for any special means or tools.

These objectives have been achieved by a removable adhesive bond according to the generic term of the claim 1, which has been modified as described by the characteristic criteria of the claim 1.

Since the carrier substrate has a lesser shear-strength than the adhesive layers coated at both sides of the substrate, the adhesive bond may be separated in a very simple manner without requiring any special means or tools, by simply subjecting the bond to a shear-force. In this case, the needed shear-force may be produced by a shifting or twisting of the bonded objects relative to each other. If the applied shear-force exceeds the shear-strength of the substrate material, this material will be split in parallel to the plane of bonding and the bonded objects will be separated from each other. Therefore, the removing or separating of the adhesive bond will occur within the carrier substrate material.

Substrate materials based on a foamed structure may be advantageously employed, whereby the foam may consist of an open-cell or closed-cell foam and may be prepared from polyethylene, polypropylene, polyacrylates, polyurethanes and poly(vinyl chloride). Advantageously, the volume weight of the foam is between 25 and 125 kg /m³.

Furthermore, carrier substrates based on non-woven mats have also been found useful, whereby the fibrous bond will be separated at the use of shear-forces. Good results have also been achieved by using carrier substrates provided with a predetermined plane of fracture, such as e.g. laminates. Thereby, it is essential, that the cohesive forces between the laminate layers are less than the adhesive forces of the adhesive bond to the objects to be bonded. In this case, the substrate material may e.g. contain polymers, glass or combinations therefrom.

It is also advantageous, if the substrate material contains cohesion-controlling additives, consisting e.g. of crosslinking agents affecting the cohesive strength of the substrate material.

The thickness of the carrier substrate material is preferably between 0.03 and 15 mm, most preferably between 0.2 and 1.5 mm.

For facilitating the removal of adhesive- and substrate residues remaining at the object surface after the splitting of the substrate material and the separating of the bond, it is advantageous to place a tear-resistant polymer film between the adhesive layers and the surface of the carrier substrate.

As adhesives, the known pressure-sensitive adhesives, hot-melt adhesives or also curable adhesives may be employed. Besides, the adhesive bond may also be formed by the evaporation of the volatile components of an adhesive composition.

The adhesive bonds according to the invention have a particular significance in the preparation of reversible adhesive bonds in the hygiene-, furniture- and automobile industry.

In this case, the adhesive materials are used in the form of tapes or strips for the fastening of hooks or emblems.

The said requirement of a removability of the adhesive bond cannot be met by conventional adhesives without the use of special tools or means in contrast to the solution according to the invention.

In the following, the invention shall be further explained by describing an execution example.

A polyethylene foam with a volume weight of 67 kg/m^3 and a thickness of 1 mm (*Alveolit TA 1501*) laminated at both sides with a $50 \text{ }\mu\text{m}$ thick polyethylene film, is coated at both sides with a polyacrylate pressure-sensitive adhesive (*Acronal 101 L*) (40 g/m^2). For obtaining an optimal anchorage of the polyacrylate adhesive on the polyethylene film on the foam material, this laminate was priorly subjected to a corona pretreatment. Then, after the coating, the adhesive layers at both sides were covered with a protective adhesion release paper.

After the removal of the release paper, a 1 cm x 2 cm large piece of the prepared adhesive material was attached onto a 1.5 cm x 2.5 cm large plastic hook. Then, this hook was adhered onto a tile. For removing this hook bonded to the tile, the hook was twisted by hand in the clockwise direction. Already after a quarter turn, the hook was separated. Thereby, the foam substrate was split in parallel to the plane of bonding.

An adhesive layer as well as also residual pieces of the foam substrate will remain on the surface of the tile and also at the plastic hook. Due to the tear-resistant film on the foam substrate, these residues may be readily removed by a simple peeling of the film from the tile and from the plastic hook, respectively.

The hook and the tile will not be damaged by the separation of the adhesive bond.

PATENT CLAIMS

1. A removable adhesive bond, wherein the adhesive bond is formed by a double-coated adhesive material, which may be split in parallel to the plane of bonding by the application of a shear-force.
2. An adhesive bond according to claim 1, wherein the carrier substrate material is an open-cell or closed-cell foamed material.
3. An adhesive bond according to claim 2, wherein the carrier substrate material is selected from the group of polyethylene, polypropylene, polyacrylates, polyurethanes and poly-(vinyl chloride).
4. An adhesive bond according to claim 2, wherein the volume weight of the foamed material is in the range from 25 to 125 kg /m³.
5. An adhesive bond according to claim 1, wherein the carrier substrate material is comprised of a non-woven fiber mat.
6. An adhesive bond according to claim 1, wherein the carrier substrate material is provided with at least one predetermined plane of fracture.
7. An adhesive bond according to claim 6, wherein the carrier substrate material is comprised of a laminate.
8. An adhesive bond according to claim 6 or 7, wherein the carrier substrate material contains polymers, metals, paper, glass or combinations thereof.
9. An adhesive bond according to claim 7 or 8, wherein the carrier substrate material contains cohesion-controlling additives.
10. An adhesive bond according to one or several of the preceding claims, wherein the carrier substrate material has a thickness from 0.03 mm to 15 mm, preferably from 0.2 mm to 1.5 mm.

An adhesive bond according to one or several of the preceding claims, wherein the carrier substrate material is separated from the adhesive layers by a tear-resistant polymer film.

12. An adhesive bond according to one or several of the preceding claims, wherein the adhesive bond is produced by pressure-sensitive adhesive compositions.
 13. An adhesive bond according to one or several of the preceding claims, wherein the adhesive bond is produced by a curable adhesive composition.
 14. An adhesive bond according to one or several of the preceding claims, wherein the adhesive bond is produced by a hot-melt adhesive composition.
 15. An adhesive bond according to one or several of the preceding claims, wherein the adhesive bond is produced by the evaporation of volatile components of an adhesive composition.
 16. An adhesive bond according to one or several of the preceding claims, wherein the carrier substrate material both-sided coated with adhesive layers, is used as a tape- or sheet-like adhesive material for a reversible bonding of objects to be combined.
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